GROWTH, CULTURE, AND PREPARATION OF TEA IN JAPAN AND CHINA.

LETTER

FROM

THE SECRETARY OF STATE,

TO CHAIRMAN OF COMMITTEE ON FOREIGN AFFAIRS,

INCLOSING

Dispatches from the legation at Yokohama and consulate at Shanghai in relation to the growth, culture, and preparation of tea in Japan and China.

FEBRUARY 19, 1873.—Referred to the Committee on Foreign Affairs and ordered to be printed.

DEPARTMENT OF STATE,
Washington, February 13, 1873.

SIR: I have the honor to inclose herewith a copy of a dispatch of the 20th June last, from the legation of the United States at Yokohama, relating to the growth, culture, and preparation of tea in Japan, and an extract from one addressed to this Department by the vice-consul-general at Shanghai, under date of September 30, 1872, in relation to the cultivation of tea in China.

The former dispatch was accompanied by some interesting drawings, which will be furnished, should your committee decide to cause the inclosures to be printed.

I have the honor to be, sir, your obedient servant,

HAMILTON FISH.

Hon. N. P. BANKS,
Chairman of the Committee on Foreign Affairs,
House of Representatives.

Inclosures.

Mr. Shepard to Mr. Fish, June 20, 1872.
Mr. Bradford to Mr. Hale, September 30, 1872.

Mr. Shepard to Mr. Fish.

No. 49.] UNITED STATES LEGATION,
Japan, June 20, 1872. (Received July 22.)

SIR: I have the honor to communicate the results of a tour, made during the past month, for the purpose of observing the growth, culture, and preparation of tea in Japan. The portion of country visited (Suruga) is one of the largest tea-growing districts in the empire, and contributes largely to the immense annual export.

This export amounted last year (tea season from June 1 to May 31) to 15,310,621 pounds, of which it is important to consider that the United States received 15,307,933 pounds, and Europe only 2,688 pounds. These figures serve to show the comparative trade of the different countries with Japan, in the matter of tea, and the particular and peculiar interest America has in that trade. As Europe monopolizes the silk, so does America the tea, and that this may more fully appear I append the following statistics:.

Appendix to No. 49.—Comparative table of total export of tea.

Year.	New York.	San Francisco.	England.	China.
1862–'63	941,001	364,187	2,597,619	2,072,894
1863–'64	1,641,316	337,363	1,605,864	1,084,152
1864–'65	1,555,808	935,044	2,506,927	257,349
1865–'66	5,644,512	888,721	988,742	2,586
1866–'67	5,305,207	1,417,396	667,061	.....
1867–'68	6,663,414	1,021,947	1,253,171	73,436
1868–'69	8,663,718	1,521,146	489,387	1,800
1869–'70	9,994,979	1,657,633	100,003	.....
1870–'71	12,101,755	2,576,297	234,933	76,483
1871–'72	13,298,085	2,009,848	2,688	.....

While other industries have been commented upon by official representatives of countries interested in them, the subject of the culture of tea, which is to America of such superior importance, has been neglected.

In the hope that some practical advantages may result from a more complete understanding of the various processes of its production, my journey was undertaken. The country visited is about 120 miles distant from Yokohama, and, as mentioned in a previous dispatch, was reached in the steam-yacht Emperor, placed at my disposal by Messrs. Walsh, Hall & Co., and manned and officered by United States sailors and seamen through the kindness of Rear-Admiral Rodgers.

Accompanying this report are a set of paintings representing most thoroughly and perfectly the preparation of tea, and I shall have occasion hereafter frequently to refer to them. Each is distinguished by a letter, as will be seen, and they may be said to afford a detailed narrative by themselves. I obtained them through the courtesy of the Governor of Shidzuoka.

The tea-plant is propagated from seed only, (which seed is contained in a little nut or capsule as represented in the painting marked A,) matures for picking in three years, and is never grafted. It is polyandrous, has a white blossom with bushy stem, and is very leafy. The leaves are elliptic and serrated except at their base, as shown in painting B. The family is the same as that of the familiar camelia. At nine or ten years it gives its largest yield, and at from twenty to twenty-five years has developed so much wood as to render cutting down to the

roots necessary. The new shoots coming up are said to produce even better leaves than the seed-planted shrub. The tree is never allowed to grow higher than four feet, and is generally kept within a limit of three feet. The soil best adapted to it is light, and is composed of sand, loam, and cinder. In case manure is used preference is given to fish and oil-cake. December is the month for planting, and at the end of the first year the condition of the stalk and leaf is as shown in the painting marked D. Painting B represents the exact formation of the leaf.

Picking.—The first pickings of the tea commence in April. At this yield leaves are the most tender. Picking continues through May and June, but the leaves are then larger and are not so highly estimated. Women are principally employed in this operation, in which a small basket is hung at the side of each person, and a large one deposited for general use. When two of these large baskets are filled, a cooly carries them to the drying-house, as is represented in the painting marked G. Only the first three leaves of every stalk or stem are picked, (see painting H,) the remainder being unfit for use.

Steaming.—As the leaves accumulate at the drying-house, they are placed in a broad, flat basket of, say, 30 inches in diameter by 3 inches in depth, and deposited for about 60 seconds in a steam-bath, covered by a wooden lid, (painting I.) The leaves, when taken from this steam-bath, are then spread upon the mats (marked K) and cooled. The only apparent effect produced upon them is a softening and shrinking of the leaf, and a slight diminution of freshness in color, (see I.)

Paper-firing.—About four cabbies' (a cabbie being $1\frac{1}{3}$ pounds) weight of the steamed leaves are then carried to pans or furnaces. These are made of stone plastered outside, about 3 feet high, $3\frac{1}{2}$ feet long by 2 feet broad, (see painting L.) In the interior and close to the ground is placed a fire of charcoal, which is not fed through any hole at the side or beneath, but is supplied at the top. Upon and inside this top is placed a gridiron (painting M) as a support, over which is placed the paper tray, (painting N,) into which the tea-leaf is thrown. This tray has a wooden frame with a bottom of five or six thicknesses of tough paper, which rests upon the gridiron, and a few days' use gives it a brown, shiny appearance. As the heat acts upon the leaves, a cooly (there being one for each pan) agitates and stirs it with his hands, (painting O.) Sometimes he rolls large bunches in his hands, distributing the leaves about the tray as he drops them. The next instant he kneads the leaves as a housewife works dough, but all the time taking care to keep them in motion. This rolling, kneading, and working continue for about an hour, when the tea is again taken out and placed upon mats to cool. Here the leaves which have not assumed a distinct twist or curl are picked out, and the remainder are again placed in the tray for additional drying, (painting P.) Again the whole is removed to the mats for cooling, and still again placed in the tray for drying, (painting Q.) It will be seen that with each successive drying the leaf takes a darker color, and becomes more and more twisted. This alternate heating and cooling produces the color, as the slower the decomposition the greater the color gained.

Sifting.—Bamboo baskets of about $2\frac{1}{2}$ feet in diameter by 3 inches in depth are suspended from the ceiling by small cords, (painting R.) The bottoms of these are of fine split bamboo, made with interstices varying according to the fineness desired. This grades the tea. Again the paper tray receives the tea, which is slightly agitated for say fifteen minutes. This operation is more to heighten the color and put a smooth

face upon the tea, than to expel moisture. The tea is now placed in bamboo scoops of about 24 by 30 inches, and by a dexterous tossing motion the dust is entirely fanned out. From this the tea is taken to long, low tables, (painting S,) where any remaining stems or uncurled leaves are removed by women and girls. This refuse tea is drunk by the very poor people, and is more frequently given away than sold. Only the very best tea is placed in jars, (represented in painting S;) the majority is packed in rough boxes, covered with paper, and weighing about 110 pounds, (80 cabbies,) the house-mark is placed upon them, and they are carried to the market towns either by coolies or upon the backs of bullocks. For Japanese consumption the tea is now considered complete, and is believed to be in its most delicate and perfect condition. All the fine qualities are preserved, while the leaf is left nearly whole or unbroken, with almost no dust. To suit the demand of American consumers it has been deemed desirable to refire the tea in the port of shipment, after its arrival from the country. This is done in iron pans, over a strong charcoal fire, and the tea is kept in these pans and constantly stirred for from forty-five to sixty minutes. The result of this process is the "toasty flavor" and the "greenish color" wanted, but it is obtained at the expense of that delicate and rich flavor which the tea has after the country manipulation, with a great increase in the quantity of dust and broken leaf, after a loss in weight of an average of about 7 per cent., and at a cost of about $1.25 per picul, or say one cent gold per pound. The refiring is unnecessary to preserve the tea for the voyage to America, or, at least, extra firing in the country at the time of the original preparation would be all that could be required in this respect, and there can be no doubt that the refiring in the ports is a positive and serious injury to its qualities as a beverage. Why tea dealers and consumers in America should demand a greenish color in the tea is not easy to understand. It is not a natural color, and can only be obtained by strong firing and stirring in pans, as stated, or artificially by an admixture of indigo, plaster of Paris, and soapstone, as in China. It is well known that all green tea from China, such as is known in common as Hyson, Young Hyson, Gunpowder, and Imperial, is made green artificially by adding indigo, &c.

Neither Chinese nor Japanese use tea in any other than its pure, natural state, and they wonder that we are content to drink what they find disagreeable, if not absolutely baneful. The keen Chinaman does not hesitate to apply the artificial coloring to suit our depraved tastes, and would doubtless add prussic acid or arsenic if he was asked so to do, and could be shown how it would pay. The Japanese have not yet shown themselves disposed to adopt these processes, and at present allow foreigners to do the work for themselves. Probably, however, they will not long hesitate to meet our exact demands, and will, without doubt, soon give us their tea exactly as it is wanted, using such chemicals as may be necessary and will pay best. When it is remembered that the coloring of the tea is a certain and considerable expense, as well as positive injury to the drinking qualities, it is difficult to understand why it is practiced. Mixtures and adulterations are generally made for the purpose of cheapening an article, or to give increased profits to unscrupulous traders. But here seems to be a clear case of its being done to satisfy the whims or fancies of consumers; consumers who are generally as ignorant of the manner of growing and curing tea as they are of the age or sex of those who grow and cure it.

It will, perhaps, assist consumers and tea-drinkers to say that the best Japan tea, in its pure, natural state, is a long, well-twisted leaf, with but

little dust or broken leaves in it, and of a brownish-green, rather than a yellowish or grayish green. All Japan teas partake of this description, even down to the cheapest; but the common grades, not so well twisted, have more dust, and open broken leaves, and are of an uneven and unbroken color.

In conclusion, I will mention briefly a few facts. Tea has been used in China, Japan, and Corea for more than one thousand years. The first foreign export was to Holland, early in the seventeenth century, and England about 1660. It is proverbial that the very finest teas are everywhere grown by priests. They are cultivated under mats, are sold in Japan at from $5 to $6 per pound, and are wholly consumed by the higher classes of the country. Mats are used because shade is found to be conducive to the most advantageous development, and where natural shade is wanting, artificial covering must be substituted.

The cultivation of tea in Japan is universal, and is pursued on the small-farming principle of the continent of Europe. No one particular person produces a very large amount. The largest plantation I visited yields only 15 piculs per year, (a picul being 133 pounds,) and the poverty of tea-farmers generally amounts almost to destitution.

One man prepares about 55 pounds of fresh leaf per day. This loses in Japanese preparation about 70 per cent., and in the additional foreign firing another 5 per cent., making an enormous loss in the aggregate of fully 75 per cent.

I am under great obligations to Professor Thomas Antisell for an analysis, which I append *in extenso*.

Should my efforts and investigations thus far meet with approbation and encouragement from the Department, I will take great pleasure at some future time in pursuing the matter to a more profitable and satisfactory end.

I have, &c.,

CHARLES C. SHEPARD,
Chargé d'Affaires.

[Inclosure 1 in No. 49.]

Mr. Antisell to Mr. Shepard.

TOKIO, (YEDO,) *June* 15, 1872.

SIR: I have the honor to hand you the chief results of the examination of the samples of tea-leaf which you forwarded to me on return from your visit to the tea country. Owing partly to the condition of the leaf I was compelled to confine my examination to determination of the amount of ash and natural moisture present in fresh leaf and at various stages of drying.

Five small samples were received from you.

No. 1, being freshly picked and without being dried.

No. 2, after being dried one minute.

No. 3, partially dried.

No. 4, still more dried.

No, 5, as prepared for market.

I ignited in small porcelain crucibles a portion of each of these samples to ascertain the amount of mineral matter yielded at different stages of drying.

In sample 5 the amount of ash was 4.94 per cent.

In sample 4 the amount of ash was 3.33 per cent.

In sample 2 the amount of ash was 2.02 per cent.

In sample 1 the amount of ash was 1.10 per cent.

In a more recent examination of leaves made on the same day on which they were picked, the ash or mineral was only nine-tenths of one per cent., (=0.9.)

An accident occurred to No. 3 sample, and there was not sufficient for another burning. I am inclined from these and other examinations of Japanese teas to fix the natural

proportion of mineral matter in the dry leaf at between 4½ and 5 per cent., while in China teas it is more frequently over 5 and reaches in colored teas to 10 per cent. The value of this portion of the inquiry was to determine when impurities exist in teas, and when adulteration commences. The amount of coloring added to China green teas is in this way now accurately known. Japan teas are not now colored for the foreign market, nor has it ever been practiced for the home market. In most of the samples the ash was whitish and yielded much phosphate and carbonate of lime.

But I have found the ash from different localities to vary, showing that tea-plants (like other vegetation) are dependent on the nature of the soil for the nature of the minerals which they select. As the soil varies, so will the mineral plant-food differ. I have found some leaves (not of these samples) to yield a red ash, containing phosphate of iron and peroxide of iron. At some future time I will make a more extended inquiry into the subject.

With regard to the amount of moisture in the leaf, all teas after drying retain some; and it is not attempted (nor is it desirable) to render them perfectly dry, the object being to remove just so much water as would, when left in the leaf, allow fermentation and decomposition to go on.

The moisture in these samples was determined by drying them first in the water-bath and then in the oil-bath, until perfectly dried, at a temperature 230 Fahrenheit.

By this method sample No. 5 yielded 8½ per cent. After this loss it was still of the same color as the sample, but was less pliant and more brittle when fingered. Sample No. 4, next driest, burned without cracking the stem or leaf, was of a blackish color, and yielded 12 per cent. of water.

Sample No. 3 yielded 19 per cent. Sample No. 2 yielded 46 per cent. Sample No. 1 yielded 74 per cent.

The examination in Europe of Chinese and of Japanese teas shows that when well dried they still contain from 4 to 5 per cent. of moisture. I have obtained by a few trials of Japanese teas, (as sold in this city,) on an average of 10 per cent. of moisture. If we assume the usual moisture of the fresh leaf to be 80 per cent., then there is over 70 per cent. of moisture unmoved by the various firing processes which are deemed necessary to bring the leaf into that condition in which it will remain unaltered during oceanic transportation.

Some manufacturers are of the opinion that the whole use of and necessity for the firing process is to secure the removal of this 70 per cent. of moisture; but a slight acquaintance with the structure of a leaf and the changes which it undergoes would modify this opinion.

The leaves upon a growing healthy plant are in a state of exact balance; if much exhalation takes place, as on a warm sunny day, much water is absorbed by the roots and carried up to replace the evaporation; if little is removed little is pumped up. The water in the leaf is thus always at par, as we might say, and as the leaf is full of water, 80 to 82 per cent., there is no room for air to enter to any great extent, if at all, into the ducts or vessels of the leaf, and so long as the leaf continues in this state it preserves its green color; but if the leaf be removed from the tree, then evaporation continues, while there is no absorption, since the leaf is not now in connection with the root, and since water cannot be had, air enters into the leaf, and, as it becomes slowly dry, it changes its color to a dirty brown or black—not merely because it loses moisture does it darken, but because, in drying, atmospheric air coming in, unites with the albuminous matter of the leaf, decomposing them and the associated chlorophyle, and reducing them to simpler chemical principles; this destruction and blackening may begin anywhere in the leaf where air and moist matters come into contact, but commonly beginning on the summit and on the crenated edges of the leaf, and traverse downward and inward toward the petiole or leaf-stalk; and the more slowly the process of drying goes on the more complete will be the internal decomposition and blackening of the leaf.

When a leaf is in the condition now described, whether dried by sun or fire, the relations of the principles contained are very different from those in the fresh leaf, the tannin or astringent principle, always present in tea, undergoes no change, while the aromatic and nitrogenous soluble principles are decomposed and lost, thus removing all agreeable flavor, and producing a decided astringent taste which predominates in the dry leaf. This is the condition of most black teas.

The aroma or flavor of the tea-leaf, so well marked when well prepared, does not exist in the plant during life; it is the result of the judicious exhibition of the heat, which develops an essential oil from the resinous matters of the leaf at temperatures slightly above that of boiling water, the oil being produced by a slow oxygenation of the native resin by the air entering in the way already described; the aroma, when lost, may be reproduced by slight warming of the leaf, but is destroyed or not producible by a high heat, hence the drying of the leaf over a naked charcoal-fire is apt to injure the amount of the aroma.

The object of applying heat in the manufacture of the tea-leaf appears to be threefold:

1st. To remove so much moisture as will allow the leaf subsequently to remain exposed to air without undergoing further change.

2d. To preserve the principles in the leaf in as natural a condition as possible, so that the astringent flavor of the tannin of the tea may not predominate.

3d. To develop a certain amount of aromatic oil, so as to communicate an agreeable bouquet and flavor to the tea.

The present modes of firing do not fully accomplish these ends; it is often an accident that these ends are obtained, and rarely is the heat so applied as to secure all three.

The arrangement in tea-firing establishments are of a very simple and primitive character. Every pan is heated by its own fire, and has a peculiar shape dependent on the fancy of the proprietor, and great limit of variation of heat applied is left to the option of superintendent or workman at the pan; so that it cannot be said that there is exact uniformity either in the amount of heat applied or time of exposure of any one pan as compared with another.

The present methods of applying heat are injurious to the leaf; methods which have been vastly improved in Europe during the last fifty years, and it is greatly to be desired that the teas of Japan should be prepared with more economy and uniformity. But on the other hand the form and condition of the present market tea is the result of this old method, and the public are used to it, and may continue to expect while improved processes may alter the marketable appearance thus. The twist in the leaf appears a necessary condition, but it is the result simply of the old method; but if new modes of applying heat were used it is a question whether it would be necessary or desirable to continue the practice of twisting the leaf when it would no longer be produced by improved methods.

The consideration of the proper amount of heat and modes of application divides itself into two:

1st. The actual *elevation* of temperature most suitable for drying.

2d. The *duration* of the application of that heat.

The effect of an *elevated* temperature on the leaf is very different from that of its *duration*, a point not perhaps sufficiently considered as yet, moist vegetable matter is so susceptible of the effects of duration of heat. A series of experiments would need to be carried out, and no doubt many have been made by intelligent merchants, and these, if collated, might yield much valuable information. The agreeable aroma of the leaf depends, I think, on the first condition, while the flavor (taste) and general appearance hangs on the second; and I think it may be stated without hesitation that there is neither necessity nor advantage in having a tea-leaf blackened while it is dried, nor to have some of its useful constituents destroyed because we desire to preserve some others, by the application of heat.

Every soldier in our late civil war who has seen or tasted the preserved vegetables furinshed to the troops in the field at depots and hospitals, through the Quartermaster and Surgeon General's Departments of the northern army, (of the Potomac,) can attest to the bright green color and fresh vegetable flavor of the preserved vegetables furnished, especially of the leafy kind, as cabbage, &c., prepared according to the French methods, (Appert and Masson.) Had these, when fresh, been subjected to the same treatment by heat as the tea-leaf is, there would be the same black astringent and otherwise tasteless result. I look upon it, then, that it is not a necessary result of drying that the tea-leaf should be formed as it is in commerce, but of the following of an antiquated method. It may be a consideration whether, our tastes for tea being fixed for over a century, we should readily alter and adopt the use of a green dry leaf instead of a black one, and manufacturers, who only desire to satisfy the market and gratify present popular tastes, may reasonably hesitate to adopt new methods.

But whether this may influence merchants at the present time or not, one thing is certain, that the present obsolete, uncertain, and uneconomical methods of applying heat cannot be continued for long; and the modern method of applying heat will be adopted, which will preserve the green color of the leaf, and public taste will have to accommodate itself to the result.

Steam-heat has almost everywhere superseded the naked fire, and by the use of steam a uniform temperature can be obtained along a whole range of pans; instead of one person to each fire or pan, a few might regulate some hundred pans; the whole series might be heated up contemporaneously to precisely the same heat, and thus an element of fixity and of uniformity would be obtained.

High-pressure steam and heated air have been used in similar cases with much advantage. Hot air (so as not to injure vegetable structure) has many recommendations in its favor, and might be made to answer the necessities of tea-drying, and I could wish to see it applied in the manufacture.

These observations are made from a slight examination into this subject, and based only upon a few experiments. They may be crude and hasty; but the manufacture of

tea is so important a subject to our commerce and to Japan as to pardon this communication, and I therefore offer them, proposing under more favorable conditions to be able to pursue the investigation.

I remain, &c.,

THOMAS ANTISELL, M. D.

Mr. Bradford to Mr. Hale.

No. 570.] UNITED STATES CONSULATE-GENERAL,
Shanghai, September 30, 1872. (Received November 23.)

SIR: * * * * * * * * *

I do not know that I can offer any information in respect of the cultivation of tea, further than that which I presume is on file in the Department of Agriculture.

I remark, however, that the black and green teas in the northern districts of China are made from the same plant, the variety *Thea Viridis*, or what is usually termed the green tea-plant. The shrub requires a rich soil, and the situation for a garden is chosen on the hill-sides, rather than on the lower plains. Care is taken to have the plantations kept free from weeds.

The first crop is ready for picking in April. Just as the budding leaves unfold they are plucked, to form the "Young Hyson," or "Bright Spring," and the "Pekoe," or "White Lair," qualities. This first crop leaf is very expensive, and mostly for presentation tea. The plant is injured by this first picking, but the rains of a week or two usually revive it, and in May a second crop is ready for picking. This is the principal crop of the season. The leaves being picked by hand, are dried, winnowed, fired, and sifted, to produce the various qualities known as "Hyson Skin," "Imperial," "Gunpowder," &c., &c.

Tea districts in which some qualities of tea are produced also give it a title, such as "Mo Sing," a district in the northeastern part of this province, "Twan Kay," from the river Twan, in Uganwhai.

The leaf is sun-dried to a certain extent, and is then placed in a heated caldron, where it is stirred about by the hand. When partly dried and quite warm, it is rolled on a bamboo-frame and table of peculiar construction. A certain amount of moisture is thus removed, and after being again sun-dried, is again and for the last time "fired." The winnowing, screening, and assorting then take place.

During this last "firing" the dyes are added to make the "green teas" for the American market. These dyes are obtained from the plants *Ioatis Indigotica* and *Kuellia*. I have visited, during the last two months, some of the tea-firing houses at Ningpo, and have seen the process of reducing the indigo to a fine powder by the use of a pestle and mortar, and mixing it with the leaves in the firing-pans, thus forming the high-priced "Gunpowder tea," to fill orders for the New York market. No Chinese would drink the decoction made from the leaves thus prepared. In the southern districts of China, Prussian blue and gypsum are used instead of the indigo.

The coolies who fire the leaf, and the women and girls who "pick" it after firing, are anything but cleanly in appearance, or practice, in many cases suffering from various cutaneous diseases.

The tea is then weighed and packed for market. A chop, consisting of from 600 to 1,200 chests, gives a special character to the tea covered by it. It consists usually of two syllables, as, for instance, "Zuh lau,"

i. e., Magnolia, "Hing lung," *i. e.*, Rising Affluence. The "chops" then find their way into the hands of the "tea-brokers."

A personal inspection of the mode of preparing the leaf is more satisfactory and instructive than a volume of description.

* * * * * * * *

I have, &c.,

O. B. BRADFORD,
Vice-Consul-General.

By mail, with this dispatch, one bag each tea-soil and tea-seed.